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NATIONAL DAM SAFETY PROGRAM. ASSUNPINK DAM NUMBER 5 (NJ00198), --ETC(U)
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DELAWARE RIVER BASIN
HORSE CREEK
MONMOUTH COUNTY
NEW JERSEY

LEVEL

ASSUNPINK DAM NO.5 NJ 00198

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

April 1979

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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East Orange, N.J. 07019

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18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

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Structural Analysis
Safety
Visual Inspection
National Dam Inspection Act Report
Assunpink, Dam #5, N.J.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

8 MAY 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Assunpink Dam No. 5 in Monmouth County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Assunpink Dam No. 5, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken:

a. Repair and seed eroded areas on all slopes.

b. Place additional barriers at access points around the perimeter of the dam to prevent erosion caused by unauthorized vehicular use of the dam surfaces.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Frank Thompson, Jr. of the Fourth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

NOTICE

THIS DOCUMENT HAS BEEN REPRODUCED FROM THE BEST COPY FURNISHED US BY THE SPONSORING AGENCY. ALTHOUGH IT IS RECOGNIZED THAT CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED IN THE INTEREST OF MAKING AVAILABLE AS MUCH INFORMATION AS POSSIBLE.

NAPEN-D
Honorable Brendan T. Byrne

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
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Trenton, NJ 08625

ASSUNPINK DAM NO. 5 (NJ00198)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 5 January 1979 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The state, under agreement with the U. S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Assunpink Dam No. 5, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken:

a. Repair and seed eroded areas on all slopes.

b. Place additional barriers at access points around the perimeter of the dam to prevent erosion caused by unauthorized vehicular use of the dam surfaces.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineer
District Engineer

DATE: 8 May 1979

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Assunpink Dam No. 5 Fed ID# NJ 00198
NJ ID# 617

State Located New Jersey
County Located Monmouth
Coordinates Lat. 4012.6 - Long. 7431.7
Stream Horse Creek (Tributary of Assunpink)
Date of Inspection 5 January 1979

ASSESSMENT OF GENERAL CONDITIONS

Assunpink Dam No. 5 is in a good overall condition and has sufficient spillway capacity to accommodate the 100-year design flood. It is recommended that its hazard classification be downgraded to low as it is situated within an undeveloped official Fish and Wildlife Management Area, and overtopping or collapse would not appreciably increase the danger of loss of life or property damage. No detrimental findings were uncovered to merit further study. Recommended remedial actions to be undertaken in the future as part of the regular maintenance program include repair and seeding of the eroded areas of all slopes and placement of additional vehicular barriers at the access points around the perimeter of the dam site.

F. Keith Jolls P.E.
Project Manager

OVERVIEW OF ASSUNPINK CREEK WATERSHED DAM SITE #5

DECEMBER, 1978

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: ASSUNPINK DAM SITE NO. 5 FED #NJ00198
AND NJ ID #617

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Divison of Water Resources. The State, in turn, is under agreement with the U.S. Army Corps of Engineers, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Assunpink Dam No. 5 and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The dam at Assunpink Site No. 5 is a two zone, 2,880 foot long earthen structure with an impervious soil core and cutoff key. The core zone has 1:1 side slopes as does the 3 foot deep cutoff key. The principal discharge outlet consists of a drop inlet structure containing a two-stage reinforced concrete riser, a 24-inch diameter reinforced concrete pipe and a reinforced concrete impact basin. The elevation of the low stage weir can be varied between elevations 98.2 and 102.7 by the use of stop logs. The reservoir is normally maintained as a dry retention-basin.

A 50-foot wide trapezoidal auxiliary spillway with a negative approach slope is located at the right abutment. The embankment has a maximum height of 13 feet to the crest elevation of 109.6.

b. Location

The dam is located on the Horse Creek tributary of the Assunpink Creek in Upper Freehold Township, Monmouth County, and is approximately one and one-tenth of a mile upstream from its confluence with the Assunpink. It is 1.4 miles east of New Sharon, a mile east of the Mercer County line and roughly 5 miles east of Interchange 7A on the N.J. Turnpike.

c. Size Classification

The dam at Site No. 5 has a maximum height of 13 feet and a maximum storage capacity of 1,060 acre-feet. Accordingly, this dam is in the intermediate size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage capacity greater than 1,000 acre-feet).

d. Hazard Classification

This dam is part of a fish and game wildlife management area and is located in a sparsely inhabited region. While there are several homes located about 9,000 feet downstream in the community of Carsons Mills, it is unlikely they would be inundated by a flood induced by a dam failure due to the large absorptive flood plain between the dam and the community. Old York Road and the N.J. Turnpike cross Assunpink Creek downstream from the dam site. The Turnpike bridge is far enough downstream (10,000 feet) and has a large enough hydraulic capacity to accommodate a dam break flood and, while the Old York Road Bridge would probably be flooded, it carries a low-usage farm road which could be closed during a flood emergency with little hardship or deleterious effect. Accordingly, this dam is recommended to be downgraded to a low hazard classification.

e. Ownership

This dam is owned by the State of New Jersey, Department of Environmental Protection, Division of Fish, Game, and Shellfisheries, Trenton, New Jersey

f. Purpose of Dam

The purpose of the dam is floodwater retention, sediment storage, wildlife management, and recreation.

g. Design and Construction History

The dam was designed in 1972 by the U.S. Soil Conservation Service as part of the overall Assunpink Creek Watershed floodwater retention program, and was constructed under the authority of the Watershed Protection and Flood Prevention Act (PL 566). Construction of the dam was completed in June 1973 by Robert T. Winzinger Inc. General Contractors.

h. Normal Operating Procedures

The dam is maintained by personnel of the N.J. Division of Fish and Game but there are no routine, day-to-day, operational procedures. The water level in the lake is regulated during the year at the direction of the Bureau of Fisheries, and is varied by changing the number of stop logs in the low stage weir of the drop inlet.

1.3 PERTINENT DATA

a. Drainage Area

Assunpink Site No. 5 has a drainage area of 1.36 square miles which consists of woodland, cropland and meadowland.

b. Total spillway capacity at maximum pool elevation - 1,200 cfs

c. Elevations (ft. above MSL)

Top of dam - 109.6

Full flood control pool (Auxiliary spillway crest) - 106.4

Recreation pool - 102.7

Streambed at centerline of dam - 96.5±

d. Reservoir

Length of maximum design pool	-	5,445 feet
Length of recreation pool	-	4,225 feet
Length of flood control pool	-	5,345 feet

e. Storage (acre-feet)

Top of dam	-	1,060
Recreation pool	-	110
Flood control pool	-	469

f. Reservoir Surface (acres)

Top of dam	-	237
Flood control pool	-	147
Recreation pool	-	50

g. Dam

Type - Earth with drop inlet and auxiliary spillway

Length - 2,880 feet

Height - 13 feet

Top Width - 12 feet

Side Slopes - 3H:1V with 10' wide berm on foreslope

Zoning - 2 zones (see attached plans)

Impervious Core - clayey and silty sand (SC-SM) compacted to 95% of maximum dry density.

Cutoff - 12' wide keyed section with core.

Grout curtain - None

h. Diversion and Regulating Tunnel

Type - None

i. Spillway

Type - Auxiliary channel excavated beyond right abutment.

Channel width - 50 feet

Crest elevation - 106.4

Gates - None

U/S Channel - Negatively sloped, grassed 650' long inlet

D/S Channel - Positively sloped, grassed 1,500' long outlet

j. Regulating Outlets

Principal spillway is a 2 stage, drop inlet structure with a 24-inch diameter reinforced concrete outlet pipe. Crest elevation of the low stage weir may be adjusted utilizing stop logs between El. 98.2 and 102.7.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Complete details of the initial design report and work plan, hydraulic determinations, structural analyses and subsurface information were available at the Soil Conservation Service offices (in Somerset) together with the as-built plans. All design was done in accordance with SCS criteria and was discussed with engineering personnel of their staff who explained in detail the various design and operational features of the dam. The main spillway drop inlet structure is a modified two-stage concrete riser of a standard design developed by the Saint Anthony Falls Hydraulic Laboratory. The risers have been modified to facilitate level control for wildlife management. The impact basin is also of a standard type developed by the Bureau of Reclamation. (This type of energy dissipator is rather widely used and functions almost completely independently of tailwater head).

2.2 CONSTRUCTION

The construction closely followed the contract plans. The dam was built under SCS supervision on lands acquired by the Department of Conservation and Economic Development with Green Acres funds. There have been no structural modifications since the initial construction.

2.3 OPERATION

As the principal purpose of the dam is to reduce urban flooding in Trenton as well as to establish a wildlife management and recreational area, the multi-purpose operation appears to function properly under the aegis of the Division of Fish and Game who regulate the water level seasonally. The reservoir is maintained at the low elevation of 102.7 which leaves most of the reservoir capacity available for flood retention.

2.4 EVALUATION

a. Availability

Sufficient engineering data was obtained to assess the structural stability in regard to the embankment zones. The foundation stability

was reviewed in the SCS design reports which substantiate its adequacy. The site is located in the outcrop area of the Englishtown Sand Formation, which is about 50 feet thick and sandwiched between the overlying glauconitic sands of the Marshallton Formation and the underlying dark clays of the Woodbury Formation. The foundation materials consist of alternating thin layers of silty and clean sands (SM and SP) with interbeds of stiff dark gray and black clay (CL and CH). The clay layers are 3 to 12 inches thick with ¼ to 2 inch thick fine clean sand partings. The concentration of clay layers diminish down to a depth of 24 feet, below which, sand layers are predominant. Groundwater movement in the foundation material occurs horizontally through the sandy interbeds which, when tapped at depths of 10, 24, and 40 feet, produce artesian flows. To alleviate seepage and prevent the possibility of boils, an impermeable 12' wide cutoff trench was extended below the more permeable sand layers, and the filter drain system was built into the toe of the dam.

b. Adequacy

The field inspection and review of the available design plans reveal that the dam is structurally sound. It is believed that the data available is adequate to render this assessment without recourse to gathering additional information.

c. Validity

The validity of the engineering data available is not challenged and is accepted without recourse to further investigations.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of Dam No. 5 was conducted on January 5, 1979 with engineering personnel of the SCS and Division of Fish and Game. The present condition of the dam was reviewed with its designers who pointed out the localized problem areas. The overall condition of the dam and appurtenant structures appears to be satisfactory. Water level in the lake at the time of the inspection was at a low pool elevation 101.2 and the tailwater was at elevation 97.8 MSL. Most of the terrain surrounding the site is wooded or under cultivation and there are several farmhouses in the vicinity of the left abutment.

b. Dam

The dam appears to be in a generally good condition. The dam is a straight earth structure lying between two naturally higher abutment zones on each side of a low lying marshy river channel. The embankment slopes have a fairly continuous cover of grass but there are bare areas where unauthorized vehicular traffic has rutted the 12-foot wide crest and sides. A steel barrier which once blocked the crest is presently missing. In its place, the Bureau of Fish and Game placed some thin saplings across the right abutment as a temporary barrier. The rather deep vehicle tracks along the toe of the left embankment were filled with ice and water. However, the water level in the lake did not extend as far as the location of the tracks, which appears to indicate the water was surface runoff or ground water originating in the small hills beyond the left abutment. Closer to the impact basin along the downstream toe were several indications of a high phreatic surface (including wet soil and frost cracking) with narrow bands of spongy, moss-covered ground and long thin trails of ice as well as standing water. In this

area, the downstream swamp lies within about 50 feet of the toe. Some light surface erosion was noted on the back slope of the dam although the area around the impact basin was completely overgrown and exhibited none of the usual erosion found behind the wingwalls. At the time of the inspection the toe drain outlets were submerged and not visible.

c. Appurtenant Structures

The intake structure was accessible at the edge of the water during the inspection since the lake was 1.5 feet below normal pool. The concrete, grating, and trash racks are in excellent condition although some very light spalling on the lakeside edges of the concrete was noted. Several of the stop logs of the low stage weir had been recently removed by bureau personnel to lower the reservoir to its present pool. The impact basin appeared to be in good condition and functioning as designed. The concrete and safety grate appeared to be satisfactory, and water stains on the concrete indicated that the tailwater was several inches below its normal elevation. The grass covered auxiliary spillway exhibited some vehicle tracks although not as prominently as noted on the dam embankment. This spillway originates in a wooded area near the right abutment, curves around the right end of the dam, and terminates several hundred feet downstream in a small stand of trees. The plans indicated a buried concrete grade beam at the crest of the spillway but this was not located in the field.

d. Reservoir

Assunpink Dam No. 5 is part of the Assunpink Creek Fish and Wildlife Management area and is located in a sparsely developed region. The lake contains many dead trees and stumps and the surrounding wooded areas extend down to the shoreline. The terrain is

generally flat and heavily wooded to the north and east while the cleared fields to the south and southeast have somewhat steeper slopes. It is apparent that many more trees on the fringes of the reservoir will be killed if the water level in the lake is raised and maintained at normal pool elevation. As previously reported, this structure is a dry dam whose primary function is flood-water retention, which may account for the apparent lack of extensive cleaning and grubbing in the reservoir area. The terrain adjacent to the downstream toe is also heavily wooded with mature stands of trees separating the dam and the downstream marshland.

e. Downstream Channel

The natural channel enters a 1,000 foot wide wetland zone a few hundred feet below the impact basin. This flood-absorbing marsh encroaches to within 50 feet of the toe of the dam at some locations. Bank erosion and floodplain scour are a minor problem. Downstream from the marshland, flow from Horse Creek combines with the Dam No. 4 discharge at the confluence with Assunpink Creek (about 100 feet upstream from the Old York Road Bridge). There are several homes located about a mile downstream but they all appear to be situated well above the flood plain.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Dam No. 5 functions as a part of the overall flood control system as well as providing a wildlife and recreational area. Operational procedures are governed by the N.J. Division of Fish and Game, Bureau of Fisheries who periodically prescribe changes in the lake level by manually adjusting the height of the stop logs.

4.2 MAINTENANCE OF DAM

The dam is maintained by personnel of the N.J. Division of Fish and Game whose field office is located a short distance upstream. They are responsible for all aspects of the dam's upkeep, operation and maintenance as well as routine patrolling. A recurring problem appears to be the use of unauthorized vehicles on the embankment. Minor defects are corrected as required but problems of a more serious nature involving structural aspects are referred to the Soil Conservation Service for additional investigation.

4.3 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No formal warning system exists, although personnel of the Division of Fish and Game regularly patrol the dam in conjunction with their other duties. A warning system is not considered necessary since the downstream area is also part of the same wildlife reservation.

4.4 EVALUATION OF OPERATIONAL ADEQUACY

A formal inspection is performed by engineering personnel of NJDFG and SCS on an annual basis. The operational and maintenance procedures in effect are considered to be adequate and efficiently performed.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Based on the criteria in the Recommended Guidelines for Safety Inspection of Dams, the 100-year frequency event was selected as the design storm by the inspecting engineer. Precipitation data was obtained from Technical Paper 40 and NOAA Technical Memorandum NWS Hydro - 33. Storage data and time of concentration were obtained from the Soil Conservation Service design calculations and reviewed in the context of the prescribed inspection criteria. Inflow to the reservoir for the selected 100-year storm was computed utilizing the HEC-1 computer program. This gave a peak inflow to the reservoir of 1,290 cfs, which when routed through the controlled-release reservoir was reduced to 49 cfs. The combined spillways have a maximum discharge capacity of approximately 1,200 cfs before overtopping occurs and can therefore accommodate the design flood. The main intake alone has a capacity roughly equal to the design flood at the moment the water level reaches the crest elevation of the auxiliary spillway.

b. Experience Data

The dam was originally designed for a 100-year frequency storm using a time of concentration of 2.6 hours. The auxiliary spillway height is established so that no design flow (according to SCS procedures) ever reaches the spillway crest; thus it is truly an emergency, auxiliary safety feature. In the original design, annual flood peak discharges were obtained from USGS records for 1924-58 from gaging data in Trenton and detailed hydraulic analyses, including infiltration studies, were exhaustively performed by the SCS to quantify final design values against the economical apportionment of the dam. The closed conduit

spillway system with a multi-stage drop inlet riser and stop logs was selected as best accommodating the design.

c. Visual Observations

With the water at low stage at the time of inspection, approximately 2 cfs was flowing out of the 24" outfall. To date, no flow has ever been transmitted by the auxiliary spillway. Visual observations confirmed all aspects and assumptions of the original design.

d. Overtopping Potential

As there are no records of the dam having been overtopped and the main and auxiliary spillway can easily accommodate the design flood, there is little potential for overtopping.

e. Drawdown Potential

Using the 1'-9" by 6" low stage orifice at the bottom of the riser tower (at El. 98.2), it would take approximately 10 days to draw the reservoir down from normal pool elevation 102.7 (assuming no inflow).

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

In view of the new condition of the dam embankment, the well-designed and supervised construction and the continuous maintenance, the dam at Assunpink Site No. 5 is deemed to be in a good condition. The upper zones of the embankment show little evidence of settlement and the main crest and adjoining cut slopes along the auxiliary spillway are at true design grade and are marred only by vehicular rutting. The illegal vehicular usage on the crest has created shallow depressions which tend to concentrate the surface run-off into widely spaced swales along each slope. If not corrected, these will eventually develop into a maintenance problem. The inspection team noted the potential of backslope erosion and the apparent swampy condition of the terrain just beyond the downstream toe. The toe drains in the vicinity of the impact basin appear to be under a continuous but modest head. In summary, nothing was visually noted to create or worsen a hazardous condition that cannot be readily maintained or corrected. Because the reservoir has been filled only intermittently to its design capacity, the long-term seepage and stability characteristics cannot be determined as yet. However, due to the modest height of the dam, they are believed to be satisfactory.

b. Design and Construction Data

From the review of the design report recommendations and contract plans for the construction, the dam appears to be well-engineered and reflects the normally conservative criteria employed by the SCS. Based upon the condition of the dam and the hazard classification, additional design studies are unnecessary under the purview of PL 92-367.

c. Operating Records

The performance of this structure has been satisfactory since its completion.

d. Post Construction Changes

There have been no major modifications which affect the overall structural integrity of the dam.

e. Seismic Stability

The dam is located in Zone 1 and has negligible potential vulnerability to seismic loadings. Experience indicates dams in Seismic Zone 1 will have adequate stability under dynamic loading conditions if stable under static loading conditions.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ REMEDIAL ACTIONS

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, Assunpink Dam No. 5 is judged to be in an excellent overall structural condition. Overtopping of the dam is a very remote possibility and no seriously detrimental conditions were observed. The dam is recommended to be placed in a low hazard category.

b. Adequacy of Information

The information made available by the Soil Conservation Service is deemed to be adequate regarding the analyses and evaluation of safe operation and structural stability.

c. Urgency

No immediate urgency is attached to implementing any further studies or the remedial measures set forth below.

d. Necessity for Further Study

In view of the overall condition of this dam and the fact that it is continually monitored by trained engineering personnel, additional inspections under the purview of P.L. 92-367 are deemed to be unnecessary. The Division of Fish and Game, in conjunction with SCS engineers, maintains an internal system of annual inspections and emergency action plans, which basically reflect the requirements mandated under P.L. 92-367.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommended Actions

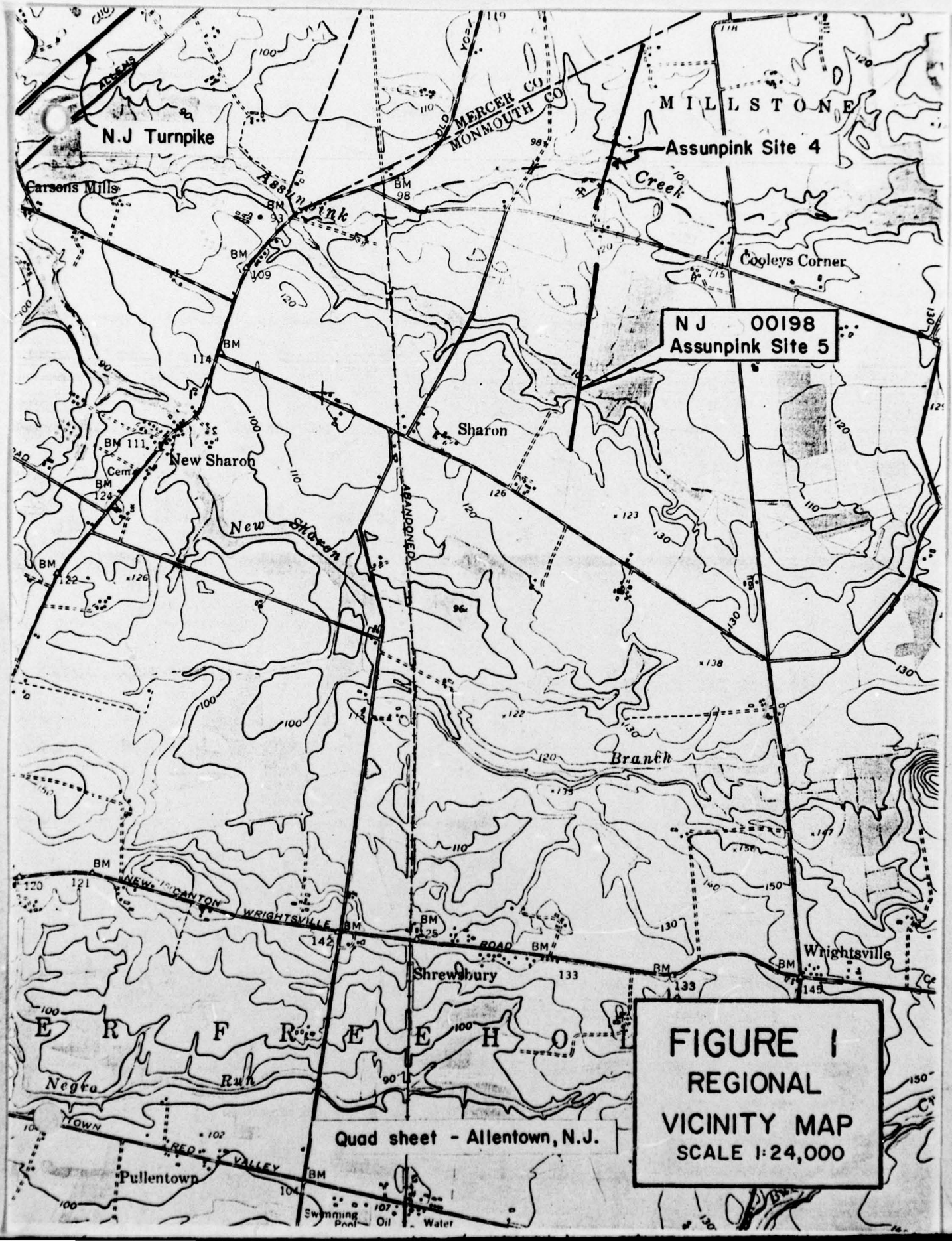
Under the present Management Area maintenance program it is recommended that the following

remedial measures be taken under advisement in the future:

- Regrade the eroded backslopes and rutted dam crest and reseed all bare areas.
- Continue to monitor the foundation seepage and the subgrade drainage system.
- Place additional vehicular barriers at various locations to inhibit the illegal vehicular use of the dam surfaces.

b. O&M Maintenance and Procedures

In view of the assessment contained herein, no additional procedures other than those presently in effect appear to be required.


N.J Turnpike
Carsons Mills
OLD MERCER CO
MONMOUTH CO
MILLSTONE
Assunpink Site 4
Creek
Cooleys Corner
NJ 00198
Assunpink Site 5
Sharon
New Sharon
Cem
New Sharon
ABANDONED
Branch
WRIGHTSVILLE
ROAD
Shrewsbury
Wrightsville
Negra Run
TOWN
RED
VALLEY
Pullentown
Swimming Pool
Oil
Water
Quad sheet - Allentown, N.J.
FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24,000

PROJECT MAP
ASSUNPINK CREEK WATERSHED
MERCER AND MONMOUTH COUNTIES, NEW JERSEY

Watershed Boundary
County Line
Township Line
City Limits
Streams
Railroads

N

0 2000' 4000' 6000' 8000'
FEET

PROJECT MEASURES

Floodwater retarding structure

Multiple-purpose structure
FW-Fish and Wildlife
R -Recreation

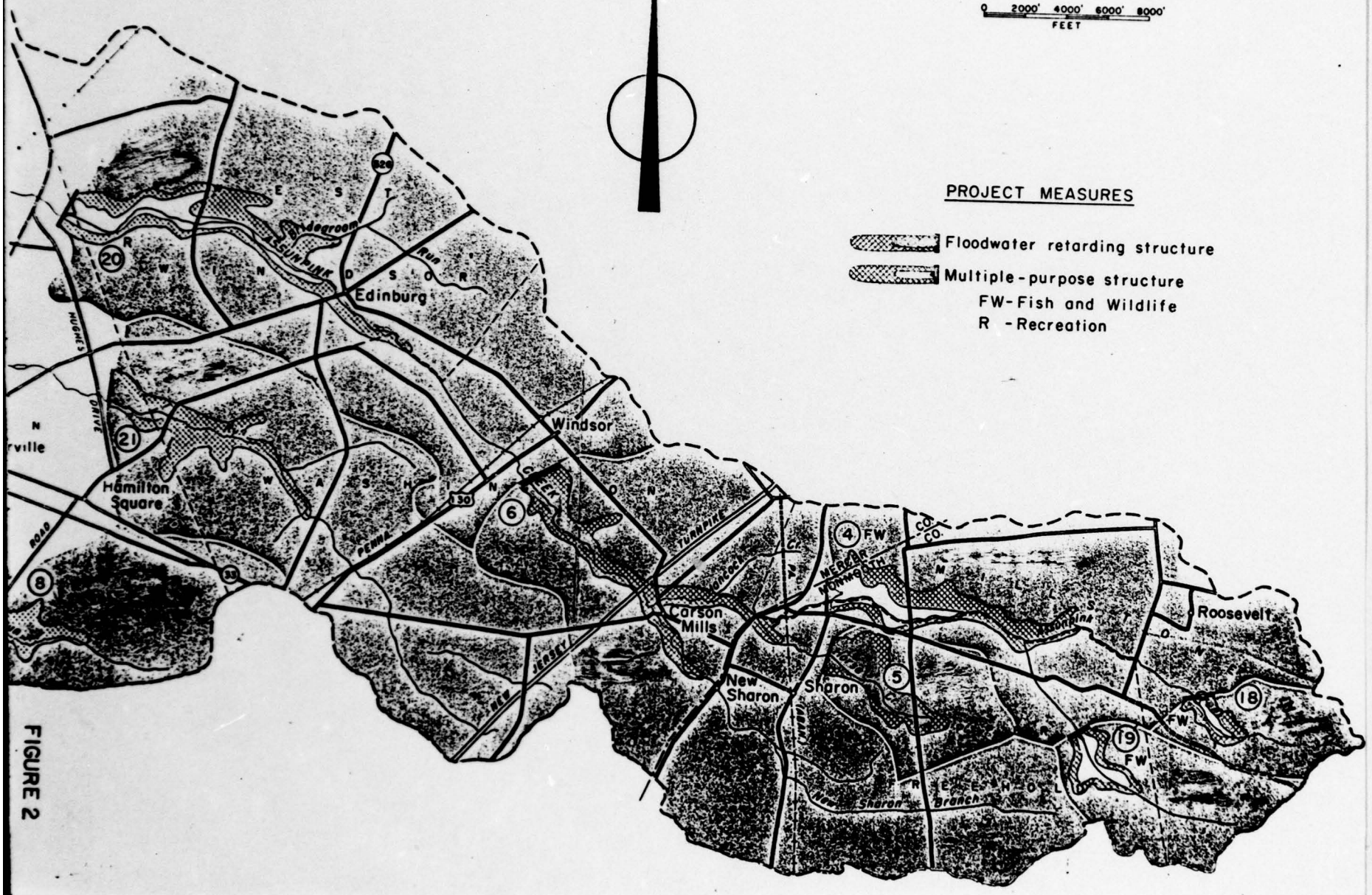


FIGURE 2

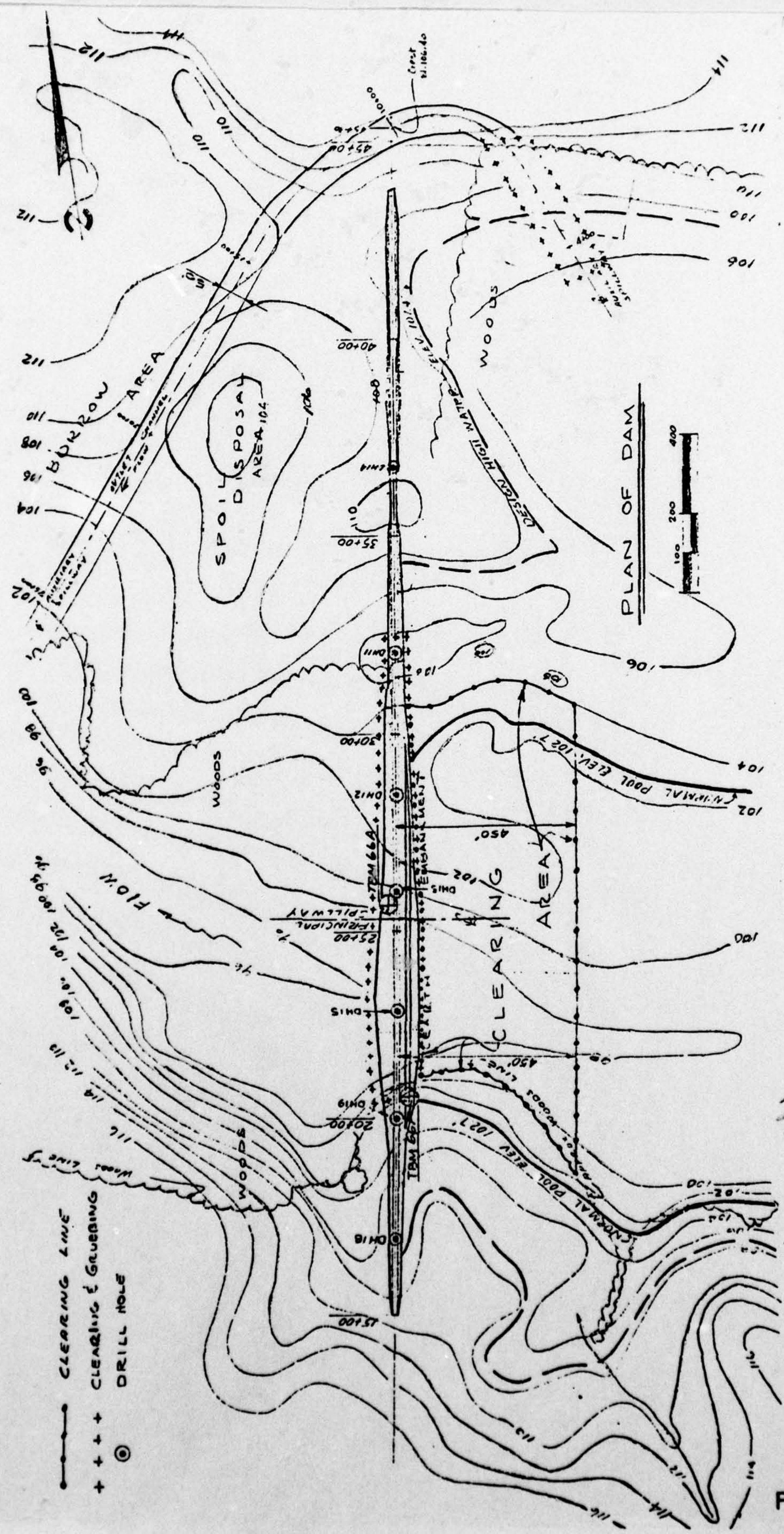
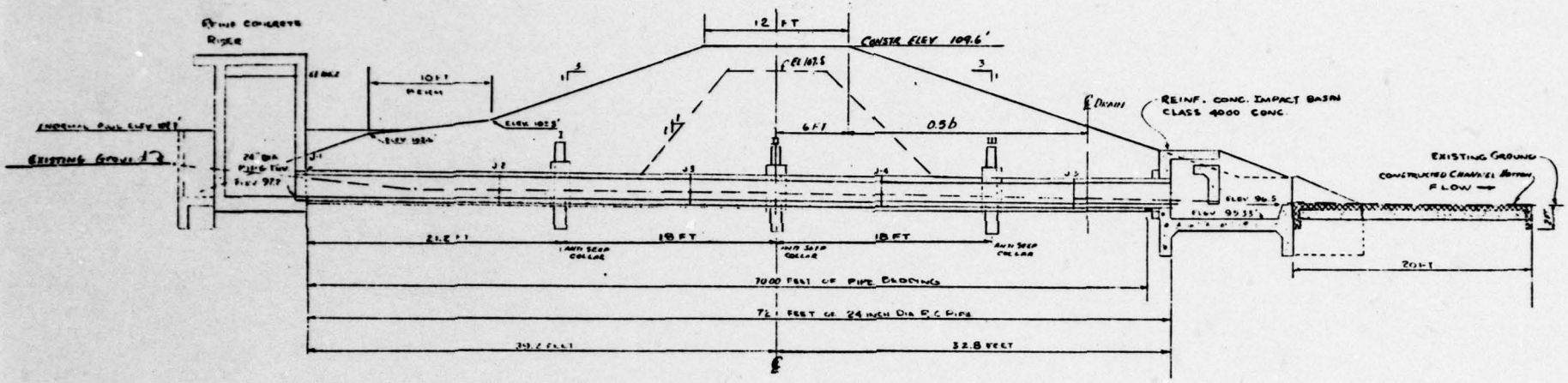

PLAN OF DAM
BORROW AREA
SPOIL DISPOSAL AREA 104
CLEARING AREA
WOODS
WOODS
WOODS
CLEARING LINE
CLEARING & GRUBBING
DRILL HOLE

FIGURE 3



PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY

SECTION @ STA 25+30

SCALE FEET

FIGURE 4

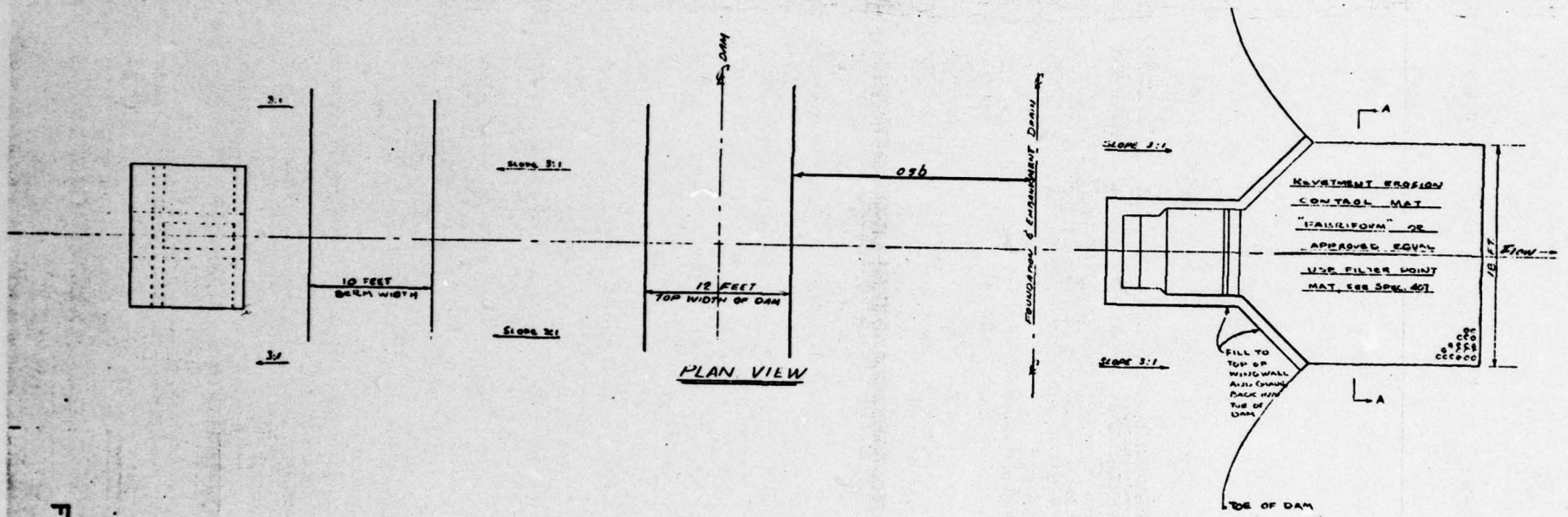

3:1
SLOPE 3:1
10 FEET
BERM WIDTH
SLOPE 3:1
3:1
DAM
12 FEET
TOP WIDTH OF DAM
036
FOUNDATION & EMBANKMENT DRAIN
PLAN VIEW
SLOPE 3:1
A
REVETMENT EROSION
CONTROL MAT
"FAIRLIFORM" OR
APPROVED EQUAL
W/2 FILTER POINT
MAT, SEE SPEC. 407
18 FT
FLOW
SLOPE 3:1
FILL TO
TOP OF
WING WALL
ALL CRACK
PACK FIN
TOE OF
DAM
A
TOE OF DAM

FIGURE 5.

Check List
Visual Inspection
Phase 1

Name Dam Assunpink Site #5 County Monmouth State New Jersey Coordinators NJDEP

Date(s) Inspection 2/17/79 1/5/79 Weather Sunny Temperature 30°F

Pool Elevation at Time of Inspection 101.2 M.S.L. Tailwater at Time of Inspection 97.8 M.S.L.

Inspection Personnel:

T. Chapter
L. Holt (NJF&G)
K. Jolls
L. Baines
F. Schmit (SCS)
E. Simone

L. Baines Recorder

Dam No. 00198

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Tire tracks along toe of left abutment. Tracks filled with ice.	Tracks made when ground was soft. This ground condition was a result of either runoff or seepage.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Light erosion on backslope.	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Satisfactory	Tire tracks on crest. Barrier across crest missing. More stringent program should be developed to prevent passage of unauthorized vehicles on or around dam.
RIPRAP FAILURES	N/A	No riprap on either face of dam.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Embankments graded smoothly into the natural terrain.	Large stands of mature trees on both sides of the right end of dam. Auxiliary spillway originates in upstream woods and curves sharply around the right end of the dam.
ANY NOTICEABLE SEEPAGE	Seepage noted along toe of left abutment. (See photo).	Discharge from impact basin immediately enters large marshland which extends to within 100' of downstream toe. Hard to tell from gradient where the swamp begins.
STAFF GAGE AND RECORDER	None	
DRAINS	Toe drains discharge through impact basin retaining walls. Drains were below tailwater elevation at the time of inspection.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed	Structure in good condition.
INTAKE STRUCTURE	Drop inlet structure with low and high crest weirs. Low crest may be regulated by stop logs. Trash racks protect all openings.	Entire structure in good condition.
OUTLET STRUCTURE	Impact basin of reinforced concrete. Discharge pipe 24" diameter.	In good condition.
OUTLET CHANNEL	Discharge flows immediately into wide marshy area during high flows. Somewhat better contained when flow is low.	Difficult to determine where swamp begins and downslope ground surface ends. Surface water lies 50-200 feet from downstream toe of left abutment.
EMERGENCY GATE	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None observed in field. However, design report refers to the existence of a protective concrete sill across the control section of the spillway.	Concrete sill may have been concealed by heavy growth.
APPROACH CHANNEL	Wide grassy channel cut into stand of trees on lake side of the embankment.	Auxiliary spillway channel skirts left abutment of Assunpink #4. Channel originates in low wooded area upstream from dam and curves around end of right embankment to terminate in another low lying stand of trees downstream of dam.
DISCHARGE CHANNEL	Channel terminates in stand of trees downstream of right central portion of dam.	
BRIDGE AND PIERS	Small bridge downstream about 3800 feet.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Flat heavily wooded area on right. Farms on left shore line. All topography very gently rolling.	Flooded lake area contains dead trees and stumps.
SEDIMENTATION	None noted. Design provides for sediment deposition at the deepest portion of the lake.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Channel enters a 1000 feet wide marshy area immediately below impact basin. High floods would disperse over wide region greatly dissipating energy of flood.	
SLOPES	Slopes are gentle and merge with surrounding terrain.	
APPROXIMATE NO. OF HOMES AND POPULATION	Several homes downstream about 1 mile but all appear to be situated above flood plain.	Flows from Dam No. 5 enter downstream channel of Dam No. 4 at a point about 100 feet upstream from the Old Cork Road Bridge.
	1 home (farmhouse) immediately downstream of left end of dam embankment. Appears to be at same or higher elevation than the dam crest.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available from SCS, New Brunswick, N.J.
REGIONAL VICINITY MAP	Available from SCS, New Brunswick, N.J.
CONSTRUCTION HISTORY	Available from SCS, New Brunswick, N.J.
TYPICAL SECTIONS OF DAM	Available from SCS, New Brunswick, N.J.
HYDROLOGIC/HYDRAULIC DATA	Available from SCS, New Brunswick, N.J.
OUTLETS - PLAN - DETAILS -CONSTRAINTS -DISCHARGE RATINGS	Available from SCS, New Brunswick, N.J.
RAINFALL/RESERVOIR RECORDS	Available from SCS, New Brunswick, N.J.

ITEM	REMARKS
DESIGN REPORTS	Available from SCS, New Brunswick, N.J.
GEOLOGY REPORTS	Available from SCS, New Brunswick, N.J.
DESIGN COMPUTATIONS	Available from SCS, New Brunswick, N.J.
HYDROLOGY & HYDRAULICS	Available from SCS, New Brunswick, N.J.
DAM STABILITY	Not available
SEEPAGE STUDIES	Available from SCS, New Brunswick, N.J.
MATERIALS INVESTIGATIONS	Available from SCS, New Brunswick, N.J.
BORING RECORDS	Available from SCS, New Brunswick, N.J.
LABORATORY	Available from SCS, New Brunswick, N.J.
FIELD	Available from SCS, New Brunswick, N.J.
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	Available from SCS, New Brunswick, N.J.

ITEM	REMARKS
MONITORING SYSTEMS	None other than frequent patrols.
MODIFICATIONS	None
HIGH POOL RECORDS	None kept
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None performed
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	None kept

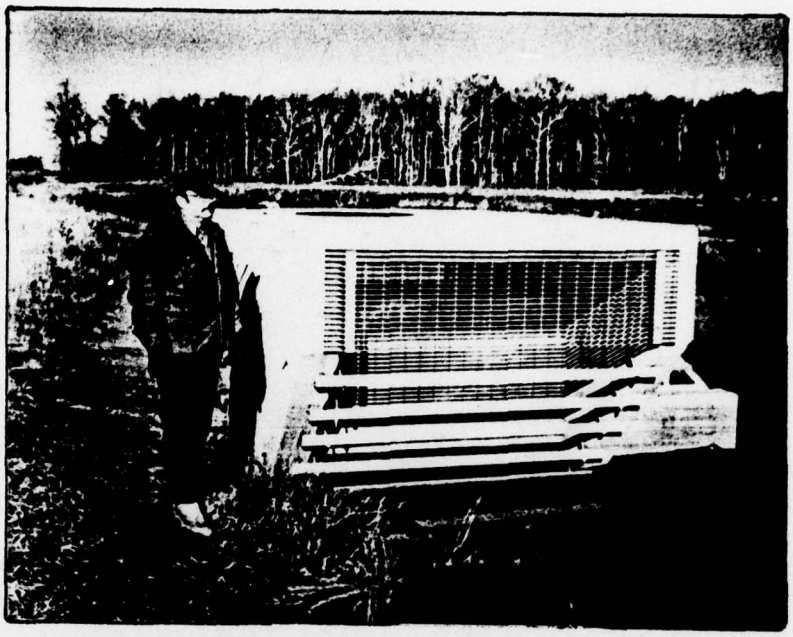
ITEM	REMARKS
SPILLWAY PLAN	Available from SCS, New Brunswick, N.J.
SECTIONS	Available from SCS, New Brunswick, N.J.
DETAILS	Available from SCS, New Brunswick, N.J.
OPERATING EQUIPMENT PLANS & DETAILS	Available from SCS, New Brunswick, N.J.

January, 1979

View of intake structure

January, 1979

View of outlet structure



January, 1979

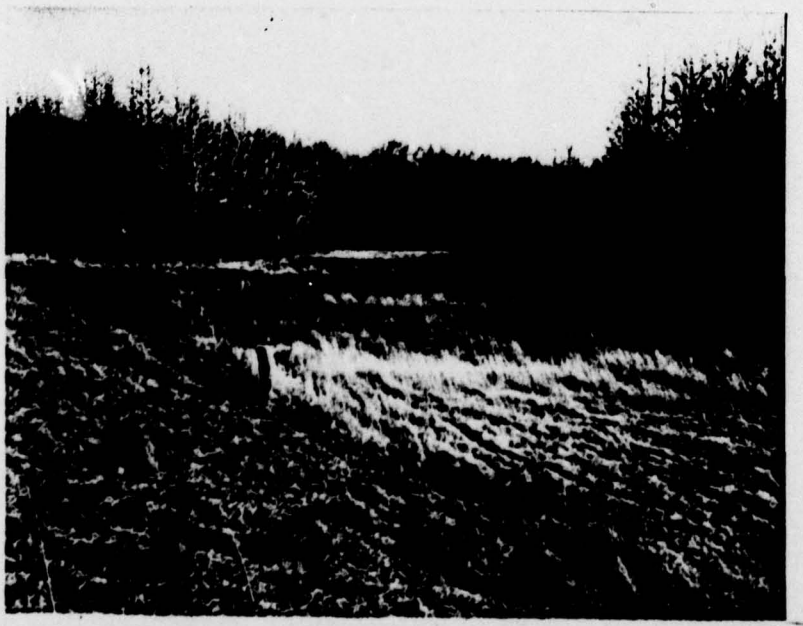
Intake structure

January, 1979

Intake structure

January, 1979

View of seepage at toe of embankment



January, 1979

View of auxiliary spillway (looking East)

Dam No. 00198

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.36 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 102.7 M.S.L. (110 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 106.4 M.S.L. (469 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 107.4 M.S.L.

ELEVATION TOP DAM: 109.6 M.S.L.

CREST:

a. Elevation 106.4 M.S.L.
b. Type Vegetated auxiliary spillway channel
c. Width 50' wide channel
d. Length 2200' long channel
e. Location Spillover Station 45+30
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 2 stage drop inlet with a 24" diameter RCP outlet
b. Location Station 25+10
c. Entrance inverts H.S.W.-105.2; L.S.W.-102.7; L.S.O.-98.2; RCP-97.2
d. Exit inverts RCP-96.5
e. Emergency draindown facilities L.S.W. w/o stop logs - El. 98.2

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 1200 CFS

BY D.J.M. DATE 1-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A1 OF

CHKD. BY DATE ASSUNPINK SITE #5 DAM INSPECTION PROJECT C227

SUBJECT

Time of concentration as computed by SCS

Time of Concentration -- Tc				
(1) Description of Course of Runoff Water	(2) Slope of Course (%)	(3) Length (l) of Course (ft)	(4) Velocity of Runoff Water (v) (ft/sec)	(5) Time (sec) (3) ÷ (4)
OVERLAND (CULT)	4.4	3000	2.0	1500
CHANNEL	0.25	4500	1.5	3000
CHANNEL (SWAMP)		2500	0.5	5000
			Sum	9500

$Tc = \frac{9500}{3600} = 2.64$ hrs.

$Tp = \frac{0.5}{2} + 0.6 \times 2.64$

$= 1.83$ hours

$Qp = \frac{484 \times 1.36 \times 1.0}{1.83}$

$= 360$ cfs

SD

BY D.J.M DATE 1-79
CHKD. BY ____ DATE ____
SUBJECT ____

LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK SITE #5 DAM INSPECTION

SHEET NO. A-2 OF ____
PROJECT C227

T hours	T/Tp	Dimensionless Ordinate (D.O.) = Q/Qp	Q = Qp × D.O cfs
0.5	0.27	0.13	47
1.0	0.55	0.51	184
1.5	0.82	0.90	324
2.0	1.09	0.98	353
2.5	1.37	0.77	277
3.0	1.64	0.53	191
3.5	1.91	0.36	130
4.0	2.19	0.24	86
4.5	2.46	0.16	58
5.0	2.73	0.109	39
5.5	3.01	0.074	27
6.0	3.28	0.053	19
6.5	3.55	0.034	12
7.0	3.83	0.024	9
7.5	4.10	0.016	6
8.0	4.37	0.011	4
			Σ 1766

Check unitgraph

$$\frac{1766 \times 3600 \times 12}{1.36 \times 5280^2 \times 2} = 1.006$$

≈ 1" over drainage area ∴ OK

BY. D J M DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK SITE #5 DAM INSPECTION

SHEET NO. A3 OF

PROJECT C 227

PRECIPITATION DATA FROM T.P. 40 & H.M.R. 35
(See curve overleaf)

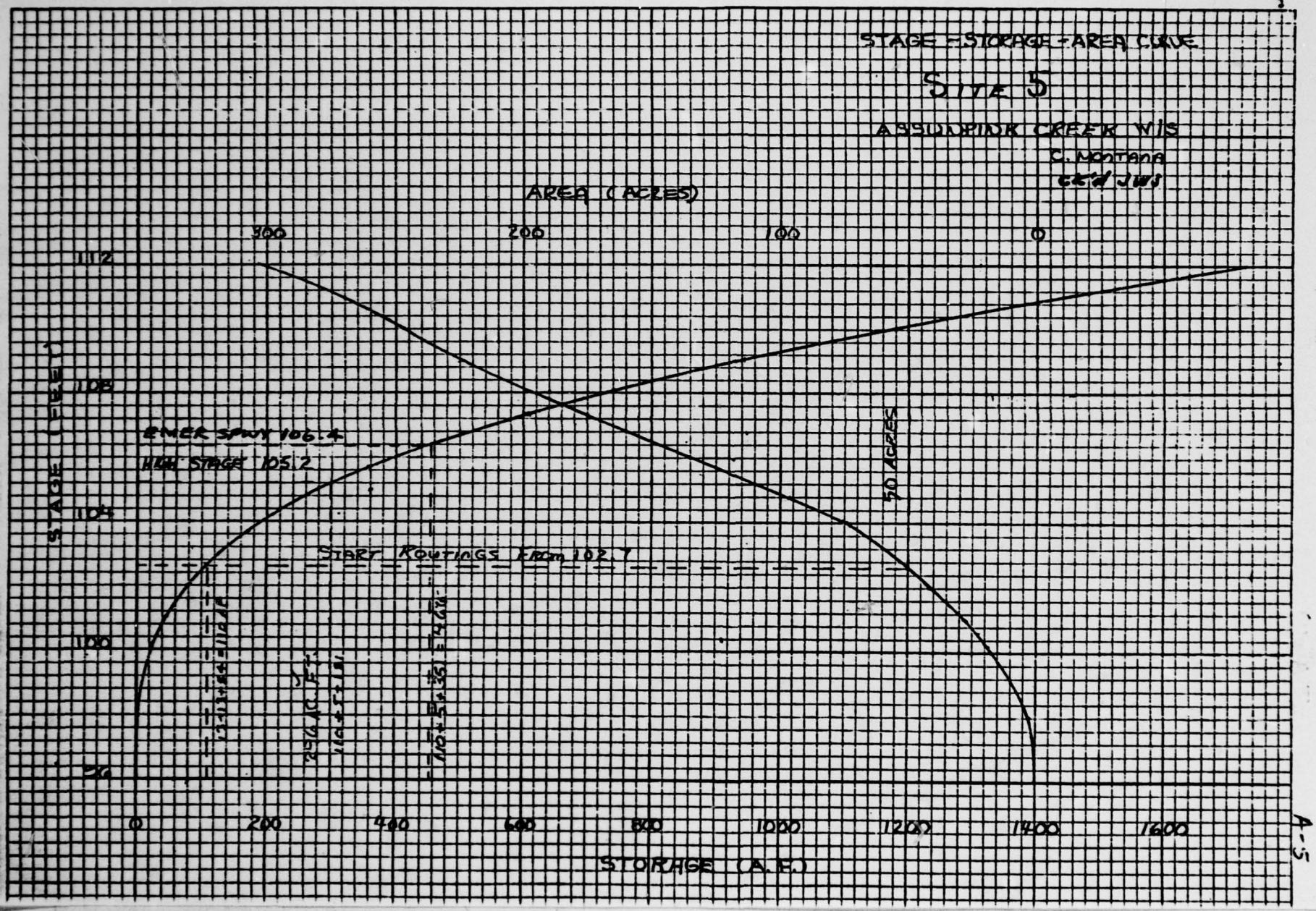
Time hours	Precipitation inches	Δ	Rearrange
0.50	2.4	2.4	0.12
1.00	3.1	0.7	0.12
1.50	3.7	0.6	0.14
2.00	4.0	0.3	0.17
2.50	4.22	0.22	0.18
3.00	4.40	0.18	0.22
3.50	4.57	0.17	0.70
4.00	4.71	0.14	2.40
4.50	4.84	0.13	0.60
5.00	4.96	0.12	0.30
5.50	5.08	0.12	0.13
6.00	5.20	0.12	0.12

BY D.J.M. DATE 2-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A4 OF
CHKD. BY _____ DATE _____ ASSUNPINK SITE #5 DAM INSPECTION PROJECT C227
SUBJECT _____

i) Normal pool elevation = +102.7 STORAGE = 0

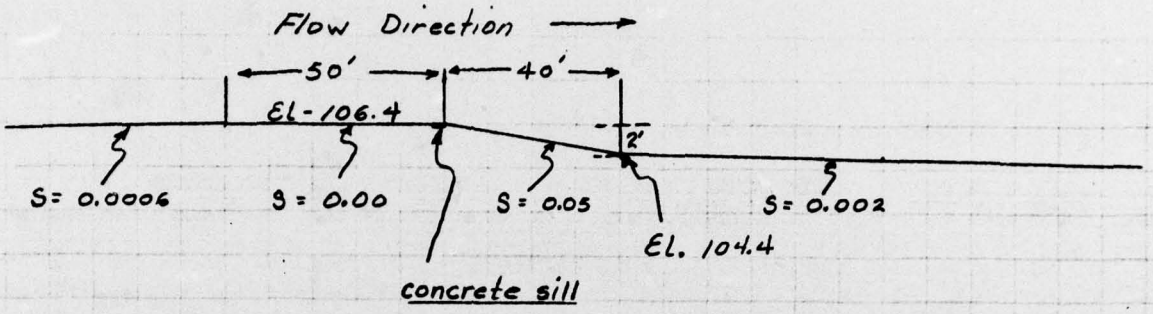
STORAGE DATA COMPUTED BY SCS (Values from curve overleaf)

HEIGHT ABOVE CREST (feet)	STORAGE (ACRE FEET)	SURCHARGE STORAGE (ACRE FEET)
0	110	0
1	170	60
2	240	130
3	370	260
4	500	390
5	670	560
6	860	750
7	1090	980
8	1350	1240


STAGE - STORAGE - AREA CURVE
SITE 5
ASSUNDINK CREEK W/S
C. MONTANA
AREA (ACRES)
300
200
100
0
1112
1108
1104
1100
1096
STAGE (FEET)
EMER SPWY 106.4
HIGH STAGE 105.2
START ROUTINGS FROM 102.7
50 ACRES
0
200
400
600
800
1000
1200
1400
1600
STORAGE (A.F.)

BY TC DATE 4-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A6 OF
CHKD. BY DATE Assunpink Site 5 Dam Inspection PROJECT C-227
SUBJECT

Auxiliary Spillway Crest Design



El.	Water Depth Over Crest	Q		El.	Corresponding Channel Depth	Q
	0.75'	273		106.4	2.0' ±	271
107.4	1.0'	432		107.1	2.7 ±	440
107.5	1.1'	512		107.4	3.0' ±	521
107.6	1.2'	591	*	107.65	3.25 ±	591
				107.7	3.3 ±	606

* Control changes from crest to channel

BY. D.J.M. DATE 2-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A7 OF.....

CHKD. BY.....DATE..... ASSUNPINK SITE 5 DAM INSPECTION PROJECT C227

SUBJECT.....

Spillway discharge calculations

flow through 1.75'x0.5 orifice C=0.6 A=0.875		flow over riser as weir			flow through riser as culvert C=0.55 A=12		Through 24" pipe L=72' n=0.012	
H	Q	H	C	Q	H	Q	H	Q
5.5	10						4.7	36
6.5	11						5.7	40
7.5	12	0.5	3.1	13			6.7	43
8.5	12				1.5	65	7.7	47
9.5	13				2.5	84	8.7	49
10.5	14				3.5	99	9.7	52
11.5	14				4.5	112	10.7	55
12.5	15				5.5	124	11.7	57
13.5	15				6.5	135	12.7	60

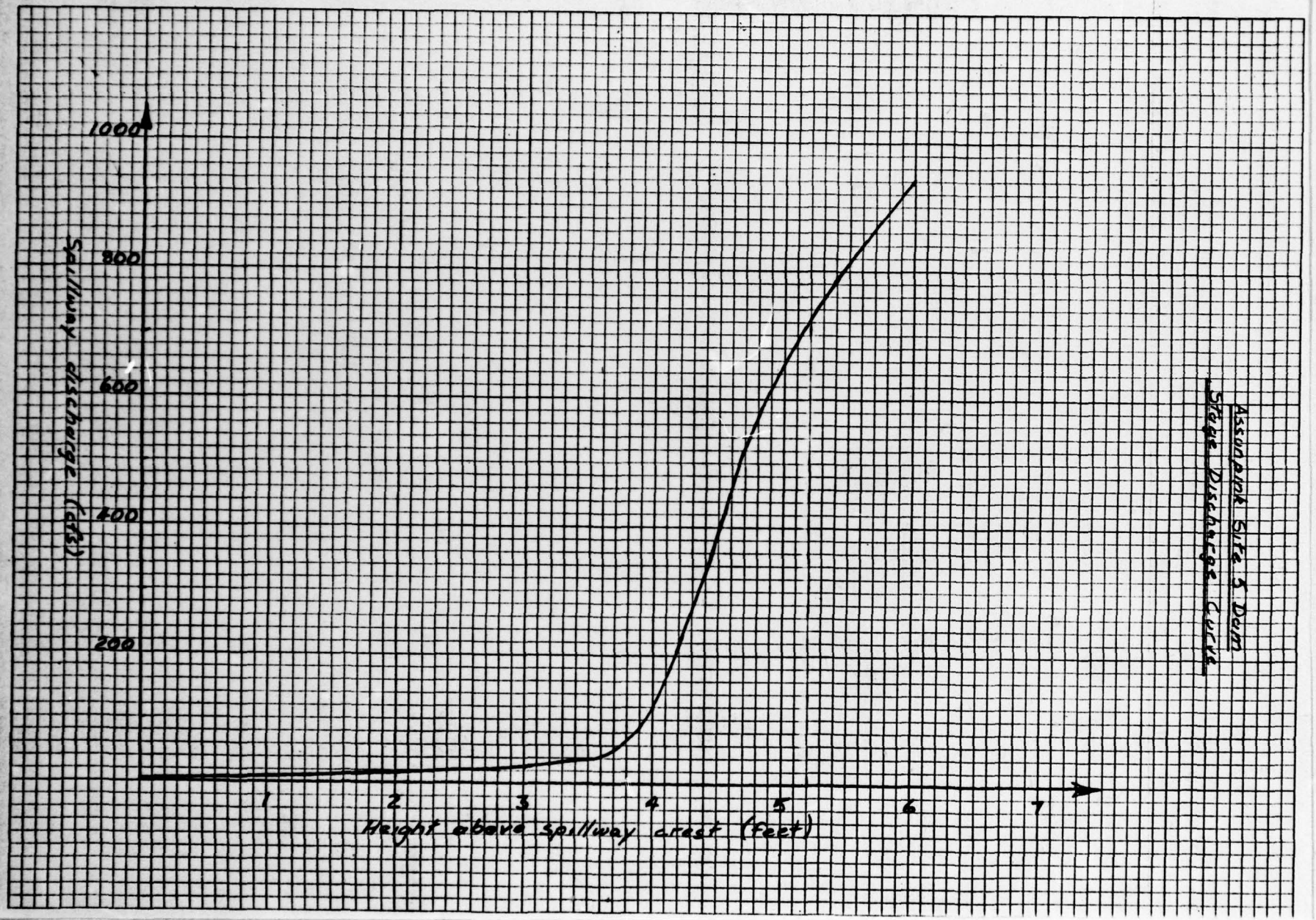
Auxillary spillway Over Dam L = 2830					ΣQ		Elev.
H	Q	H	C	Q	H	Q	
					1	10	103.7
					2	11	104.7
					3	25	105.7
0.3	68				4	115	106.7
3.3*	606				5	655	107.7
4.3	890				6	942	108.7
5.3	1195	0.1	2.7	242	7	1492	109.7

* Control changes from crest to "break" in gradient El.- 107.6

flow through 24" pipe calculated assuming tailwater el. +99.0

formula $Q^2 = \dfrac{100\,H_T}{\left[\dfrac{2.5209\,(1+K_e)}{D^4} + \dfrac{466.18\,n^2 L}{D^{5.33}}\right]}$

L = 72' n = 0.012 Ke = 0.5



BY LB DATE FEB '79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A9 OF.

CHKD. BY DATE ASSONPINK SITE #5 PROJECT

SUBJECT DRAWDOWN COMPUTATIONS

Approximate drawdown calculations

- Assuming no inflow to reservoir

ELEV. FT.	TOTAL STORAGE ACRE-FT	DIFF STORAGE ACRE-FT	DISCHARGE ACTUAL CFS	DISCHARGE AVER. CFS	AVERAGE DISCHARGE ACREFT/DAY	DRAWDOWN TIME DAYS
102.7	110		9			
		30		8.5	16.9	1.8
102	80		8			
		30		7.5	14.9	2.0
101	50		7			
		25		6.5	12.9	1.9
100	25		6			
		15		5	9.9	1.5
99	10		4			
		10		2	4.0	
98.2	0		0			2.5

Σ 9.7 days

Q low stage orifice $= C_A\sqrt{2gH}$

$= .6(.875)\sqrt{2(32.2)XH}$

$= 4.2131\sqrt{H}$

BY DJM DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK CREEK SITE 5

SHEET NO. A-10 OF

PROJECT C-227

ASSUNPINK SITE 5 DAM INSPECTION NORTH GROUP C227
BY D.J.MULLIGAN
FEBRUARY 1979

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	30	0	0	0	0	0	0	0

JOPER	NWT
3	0

********** *********** ********** ********* **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
11	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	1.36	0.0	1.36	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
12	0.0	0.0	0.0

PRECIP PATTERN

0.12	0.12	0.14	0.17	0.18	0.22	0.70	2.40	0.60	0.30
0.13	0.12								

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

GIVEN UNIT GRAPH, NUHGQ= 16

47.	184.	324.	353.	277.	191.	130.	86.	58.	39.
27.	19.	12.	9.	6.	4.				

UNIT GRAPH TOTALS 1766. CFS OR 1.01 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.12	0.00	0.
2	0.12	0.00	0.
3	0.14	0.00	0.
4	0.17	0.04	2.
5	0.18	0.13	13.
6	0.22	0.17	43.
7	0.70	0.65	116.
8	2.40	2.35	341.
9	0.60	0.55	772.
10	0.30	0.25	1180.

BY DJM DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK CREEK SITE 5

SHEET NO. A-11 OF

PROJECT

11	0.13	0.08	1290.
12	0.12	0.07	1104.
13	0.0	0.0	836.
14	0.0	0.0	603.
15	0.0	0.0	417.
16	0.0	0.0	284.
17	0.0	0.0	191.
18	0.0	0.0	131.
19	0.0	0.0	90.
20	0.0	0.0	60.
21	0.0	0.0	42.
22	0.0	0.0	28.
23	0.0	0.0	17.
24	0.0	0.0	5.
25	0.0	0.0	2.
26	0.0	0.0	1.
27	0.0	0.0	0.
28	0.0	0.0	0.
29	0.0	0.0	0.
30	0.0	0.0	0.
31	0.0	0.0	0.
32	0.0	0.0	0.
33	0.0	0.0	0.
34	0.0	0.0	0.
35	0.0	0.0	0.
36	0.0	0.0	0.
37	0.0	0.0	0.
38	0.0	0.0	0.
39	0.0	0.0	0.
40	0.0	0.0	0.
41	0.0	0.0	0.
42	0.0	0.0	0.
43	0.0	0.0	0.
44	0.0	0.0	0.
45	0.0	0.0	0.
46	0.0	0.0	0.
47	0.0	0.0	0.
48	0.0	0.0	0.
49	0.0	0.0	0.
50	0.0	0.0	0.
51	0.0	0.0	0.
52	0.0	0.0	0.
53	0.0	0.0	0.
54	0.0	0.0	0.
55	0.0	0.0	0.
56	0.0	0.0	0.
57	0.0	0.0	0.
58	0.0	0.0	0.
59	0.0	0.0	0.
60	0.0	0.0	0.
61	0.0	0.0	0.
62	0.0	0.0	0.
63	0.0	0.0	0.
64	0.0	0.0	0.
65	0.0	0.0	0.
66	0.0	0.0	0.
67	0.0	0.0	0.
68	0.0	0.0	0.
69	0.0	0.0	0.
70	0.0	0.0	0.
71	0.0	0.0	0.

72	0.0	0.0	0.	
73	0.0	0.0	0.	
74	0.0	0.0	0.	
75	0.0	0.0	0.	
76	0.0	0.0	0.	
77	0.0	0.0	0.	
78	0.0	0.0	0.	
79	0.0	0.0	0.	
80	0.0	0.0	0.	
81	0.0	0.0	0.	
82	0.0	0.0	0.	
83	0.0	0.0	0.	
84	0.0	0.0	0.	
85	0.0	0.0	0.	
86	0.0	0.0	0.	
87	0.0	0.0	0.	
88	0.0	0.0	0.	
89	0.0	0.0	0.	
90	0.0	0.0	0.	
91	0.0	0.0	0.	
92	0.0	0.0	0.	
93	0.0	0.0	0.	
94	0.0	0.0	0.	
95	0.0	0.0	0.	
96	0.0	0.0	0.	
97	0.0	0.0	0.	
98	0.0	0.0	0.	
99	0.0	0.0	0.	
100	0.0	0.0	0.	
SUM	5.20	4.29	7568.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1290.	605.	158.	76.	7568.
INCHES		4.14	4.31	4.31	4.31
AC-FT		300.	313.	313.	313.

HYDROGRAPH ROUTING

ROUTING THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
111	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	0.

STORAGE=	0.	60.	130.	260.	390.	560.	750.	0.	0.	0.
OUTFLOW=	0.	10.	11.	25.	115.	655.	942.	0.	0.	0.

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	0.	0.
2	0.	0.	0.
3	0.	0.	0.
4	0.	1.	0.

BY. DJM DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK CREEK SITE 5

SHEET NO. A-13 OF

PROJECT C-227

5	0.	7.	0.
6	1.	28.	0.
7	5.	80.	1.
8	14.	229.	2.
9	37.	556.	6.
10	77.	976.	10.
11	128.	1235.	11.
12	176.	1197.	16.
13	216.	970.	20.
14	245.	719.	23.
15	265.	510.	28.
16	278.	350.	37.
17	286.	238.	43.
18	291.	161.	46.
19	293.	111.	48.
20	294.	75.	49.
21	294.	51.	49.
22	294.	35.	48.
23	293.	23.	48.
24	291.	11.	47.
25	290.	4.	46.
26	288.	1.	44.
27	286.	1.	43.
28	284.	0.	42.
29	283.	0.	41.
30	281.	0.	40.
31	279.	0.	38.
32	278.	0.	37.
33	276.	0.	36.
34	275.	0.	35.
35	273.	0.	34.
36	272.	0.	33.
37	271.	0.	32.
38	269.	0.	31.
39	268.	0.	31.
40	267.	0.	30.
41	266.	0.	29.
42	264.	0.	28.
43	263.	0.	27.
44	262.	0.	26.
45	261.	0.	26.
46	260.	0.	25.
47	259.	0.	25.
48	258.	0.	25.
49	257.	0.	25.
50	256.	0.	25.
51	255.	0.	24.
52	254.	0.	24.
53	253.	0.	24.
54	252.	0.	24.
55	251.	0.	24.
56	250.	0.	24.
57	249.	0.	24.
58	248.	0.	24.
59	247.	0.	24.
60	246.	0.	23.
61	245.	0.	23.
62	244.	0.	23.
63	243.	0.	23.
64	242.	0.	23.
65	241.	0.	23.

A-1

BY. DJM DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK CREEK SITE #5

SHEET NO. A-14 OF

PROJECT C-227

66	240.	0.	23.
67	239.	0.	23.
68	238.	0.	23.
69	237.	0.	23.
70	236.	0.	22.
71	236.	0.	22.
72	235.	0.	22.
73	234.	0.	22.
74	233.	0.	22.
75	232.	0.	22.
76	231.	0.	22.
77	230.	0.	22.
78	229.	0.	22.
79	228.	0.	22.
80	227.	0.	21.
81	227.	0.	21.
82	226.	0.	21.
83	225.	0.	21.
84	224.	0.	21.
85	223.	0.	21.
86	222.	0.	21.
87	221.	0.	21.
88	220.	0.	21.
89	220.	0.	21.
90	219.	0.	21.
91	218.	0.	20.
92	217.	0.	20.
93	216.	0.	20.
94	215.	0.	20.
95	215.	0.	20.
96	214.	0.	20.
97	213.	0.	20.
98	212.	0.	20.
99	211.	0.	20.
100	210.	0.	20.
SUM			2486.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	49.	46.	33.	25.	2486.
INCHES		0.31	0.90	1.42	1.42
AC-FT		23.	65.	103.	103.

****

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	11	1290.	605.	158.	76.	1.36
ROUTED TO	111	49.	46.	33.	25.	1.36

A-15.1